SEP 17 1985

Lawler, Matusky & Skelly Engineers
Environmental Science & Engineering Consultants

ONE BLUE HILL PLAZA, PEARL RIVER, NEW YORK 10965
(914) 735-8300
TWX: LMSE PERL 710-577-2762

JOHN P. LAWLER, P.E.
FELIX E. MATUSKY, P.E.
MICHAEL J. SKELLY, P.E.
KARIM A. ABOOD, P.E.
PATRICK J. LAWLER, P.E.
FRANCIS M. McGOWAN, P.E.
THOMAS L. ENGLERT, P.E.

16 September 1985
File No. 464-001

Denis V. Brenan, Esquire
Morgan, Lewis & Bockius
2000 One Logan Square
Philadelphia, Pennsylvania 19103

Dear Mr. Brenan:

Enclosed is our final draft of the presentation to EPA of the portion of the remediation plan describing the subsurface drains. We have made all the changes agreed upon during our conference call last Friday.

We have also enclosed a draft of the O&M costs table for your information.

If you have any questions or need additional information, please give me a call.

Very truly yours,

John Isbister

John Isbister
Chief Hydrogeologist

JI:gmk

Enclosures

000545

000071

16 September 1985
File No. 464-001

REMEDIATION PLAN - SUBSURFACE DRAINS

The draft RIFS for the Tybouts Corner Landfill included several alternative remedial actions. Prior to publication of the draft the generators recommended a remedial plan including a subsurface drain arrangement involving two drains, one along the eastern (Route 13) boundary of the landfill and a second from Route 13 to Route 71 along the southern (or southwestern) side of the landfill to lower the water table in the refuse and to collect leachate. Principally, because of a difference in interpretation of the data involving (1) the occurrence of the Merchantville Formation and (2) the elevation of the water table prior to gravel mining operations, EPA, DNREC, and NUS argued that the southern drain would not capture leachate because of the perching influence of the confining bed underlying the refuse. In the spirit of cooperation and sharing a mutual desire to agree upon a cost effective plan to remediate the landfill, we have reexamined the data and considered the objections of all parties to the original plans. Where no data refute the NUS interpretation, we have accepted it and input the NUS data in the groundwater model to evaluate several different subsurface drain arrangements. In addition, we have had on-going discussions with NUS in an attempt to arrive at a mutually agreeable remedial scheme that accomplished the stated objectives, which are:

000546

2 000072

1. To eliminate or appreciably reduce infiltration

2. To eliminate or control lateral migration of groundwater into the landfill.

3. To eliminate or control the contaminated groundwater that might eminate from the landfill, and

4. To eliminate or control the present surface discharge of leachate to the environment.

The remedial technologies incorporated in the revised remedial alternative are all described in the draft RIFS. The recommended alternative would include:

1. Installation of a low permeability cap with a synthetic liner and surface runoff control.

2. Construction of an upgradient interceptor subsurface drain.

3. Construction of a downgradient contaminated groundwater control subsurface drain.

4. Collection and disposal of contaminated groundwater stored in the refuse.

The design and construction of the low permeability cap (Item 1) is described separately. While the synthatic liner is practically impemeable, our model input assumed leakage through the cap of 7% of the 12.5 in. per year of existing infiltration. This averages about 3000 gpd. Items 2 and 3 are described in detail in the following paragraphs. Item 4 is presently under discussion by others with Wilmington Suburban Sewer District and Texaco Oil Company.

As mentioned above, we have obtained the input data file for the NUS model and have used it in our model tests to optimize the design of a subsurface drainage system. Initially, the model was used to simulate the existing water table as a check on its reliability. This being accomplished, the model was used to simulate water-table elevations and flows for a number of subsurface drain configurations. The model output data were used to contour the water table after remediation when steady state conditions have been achieved. These contours were used to determine directions of lateral groundwater movement and to estimate flow from the drains and rates of groundwater movement. After arriving at the optimal alternative under steady state conditions, the drain configuration was tested for a number of time dependent stress periods. The tests indicate that the system described below will accomplish the desired remediation.

The upgradient subsurface drain extends from Route 13 in a straight line along the northern boundary of the landfill in a generally westward direction to Route 71, where the ditch turns southward for a short distance along the western boundary of the landfill (see Figure 1). The total length of the drain is 1,400 feet, and its depth ranges from 27 to 33 feet. These depths are coincident with the top of the confining layer under the landfill, based on NUS data. The drain will be constructed by excavating a trench to the required depth and laying in the bottom a 6-inch diameter perforated PVC collector pipe. This pipe will be surrounded by gravel, which will be extended upward to the level of the existing water table. The gravel will be covered with a geotextile fabric and the ditch backfilled with soil to land surface. A typical section is enclosed as Figure 2. The surface grading will be extended to divert all site surface discharge to the surface drainage ditch where it will be diverted to Pigeon Run. The pipe and the drain will be pitched to the southeast to a collector sump, where the water will be pumped to a disposal facility. In time, it is expected that this drain will yield water that could be diverted to Pigeon Run.

The purpose of the upgradient subsurface drain is to intercept groundwater flow onto the landfill from the north, northeast, and northwest. The model simulation indicates that this revised drain effectively intercepts the water flowing through the Columbia Formation that would otherwise flow into the refuse. The drain follows a straight line across the north end of the landfill, which leaves a small portion of waste on the upgradient side of the drain. However, the drain will lower water levels on the upgradient (north) side as well as the downgradient (landfill) side, and the simulation indicates that the waste will be essentially dewatered. Although unlikely, if a small amount of contaminated groundwater is generated in this area, it would migrate directly into the drain, where it would be captured.

The downgradient drain is designed to collect contaminated groundwater from both the Columbia Formation and the upper Potomac Formation. This drain will lower groundwater levels in its vicinity and will eliminate the seep that occurs along the east side of Route 13 north of Red Lion Creek. The downgradient drain is about 1,600 ft long and follows the perimeter of the southernmost tongue of refuse in the main landfill (see Figure 1). One leg of the drain runs generally southward in the drainage gully located on the west side of the access road. Opposite the toe of the waste, the drain turns eastward in a straight line to the edge of the property near well TY-205. At this point, the drain turns northward a short distance along the Route 13 property boundary. The depth of the collector will range from 10 to 20 ft below grade and will average 15 feet. The northern extremities will collect flow from the Columbia Formation and the southern portion of the drain will collect water from the upper part of the Potomac Formation. Design of the drain will be the same as the deeper 15 ft segment of the north drain. A typical section is shown on Figure 2.

The drain along the north side of the site could be constructed in two stages: a shallow open ditch about 15 ft deep with a steep-walled box trench within it for the lower 15 ft. A construction easement would be needed for the construction of the open ditch, as the excavation would encroach on state property. However, the completed drain system could be contained on site. Manholes are proposed at 300-400 ft spacing to monitor and regulate flow and to remove sediment if its accumulation interferes with system performance. Residual excavated soil will be used to achieve the requisite surface grade on the landfill and to construct surface water diversion courses. The segments of the north drain at its western end may require sheet piling (with salvage of the piles) through the refuse and along Route 71. Drain depths in this area average 30 ft. The construction will be phased so that the waste sump and disposal line for each drain are constructed first. Waste water generated during construction will be monitored for quality and discharged via the waste lines.

The results of the computer model indicate that after a period of about 3 years, the water table in the refuse will have been lowered to the extent that the refuse is essentially dewatered. Figure 1 shows the water table configuration simulated by the model after remediation, and Figure 3 indicates the amount of water-level depression accomplished by the remediation. Using the model predictions, we estimate that only about 6% of the refuse will remain saturated under the scheme, a large part of which is in the depression surrounding well TY-311. It should be noted that because of this depression in the confining bed, no system of subsurface drains will accomplish 100% dewatering of the refuse. However, recharge to this depressed area will be drastically reduced, if not eliminated, by the proposed remediation scheme, and little contaminated groundwater should be generated once this system has drained the refuse.

Wet sumps will be installed at the eastern end at each drain. The sumps will each have a backup pump. The north drain sump will be designed for 100 gpm pending final design data while the south drain is expected to handle a maximum of 50 gpm. A 4 in diameter discharge line from the north drain will extend to the south drain sump

Run. One line from the south sump will go to the stream and a second to either the Texaco facility or the Wilmington sewer connection. Either is about 2 miles from the landfill.

The computer modelling indicates that maximum water level drawdown will be reached about 3 years after the onset of operation. The combined flows to the two drains at that time are estimated at 15 gpm. Initial flows will be somewhat higher (80 gpm), but the flows from both systems can be staged intentionally, thereby reducing the initial volumes significantly. The construction will be phased so that the waste sump and disposal line for each drain are constructed first. Waste water generated during construction will be monitored for quality and discharged via the waste lines.

Interpretation of the simulated water-table map (Figure 1) indicates a small amount of flow onto the landfill after remediation. However, the flow from the northwest will be chiefly beneath the refuse in Columbia sand. Some of this water will discharge vertically to the Potomac Formation and the remainder will be captured by the Route 71 trench. The total flow onto the landfill along Route 71 is estimated at 1,440 gallons per day, which is equivalent to 1 gpm. Some flow will also occur from the Route 13 side of the landfill, draining parts of the Wagner and Texaco properties. The estimate of this flow is 1,300 gpd (1 gpm), which is also insignificant compared to the total flow of 11,500 gpd (8 gpm) that will be intercepted by the northern drain.

This plan has been discussed with NUS during its development and has been tested by NUS on their model. It is our considered opinion that this plan accomplishes the desired remediation in a cost effective manner. In addition, the downgradient drain has the further advantage of collecting contaminated groundwater, which the upgradient interceptor drains described in the RIFS did not do.

In summary, the proposed cap and subsurface drain system described above will adequately satisfy all of EPA's objectives for remediation of Tybouts Corner Landfill.

- The low permeability cap will appreciably reduce infiltration to less than 7% of the present infiltration.

- A estimated 80 to 90% of actual migration of groundwater into the landfill will be collected by the north drain.

- Contaminated groundwater will be largely eliminated by source control as a result of capping and the upgradient (north) drain; residual contaminated groundwater will be collected by the downgradient (south) drain.

- Present surface discharges (seeps) to the environment will be eliminated since the cap and drains will lower the water in the landfill and the water will now flow to the south drain.

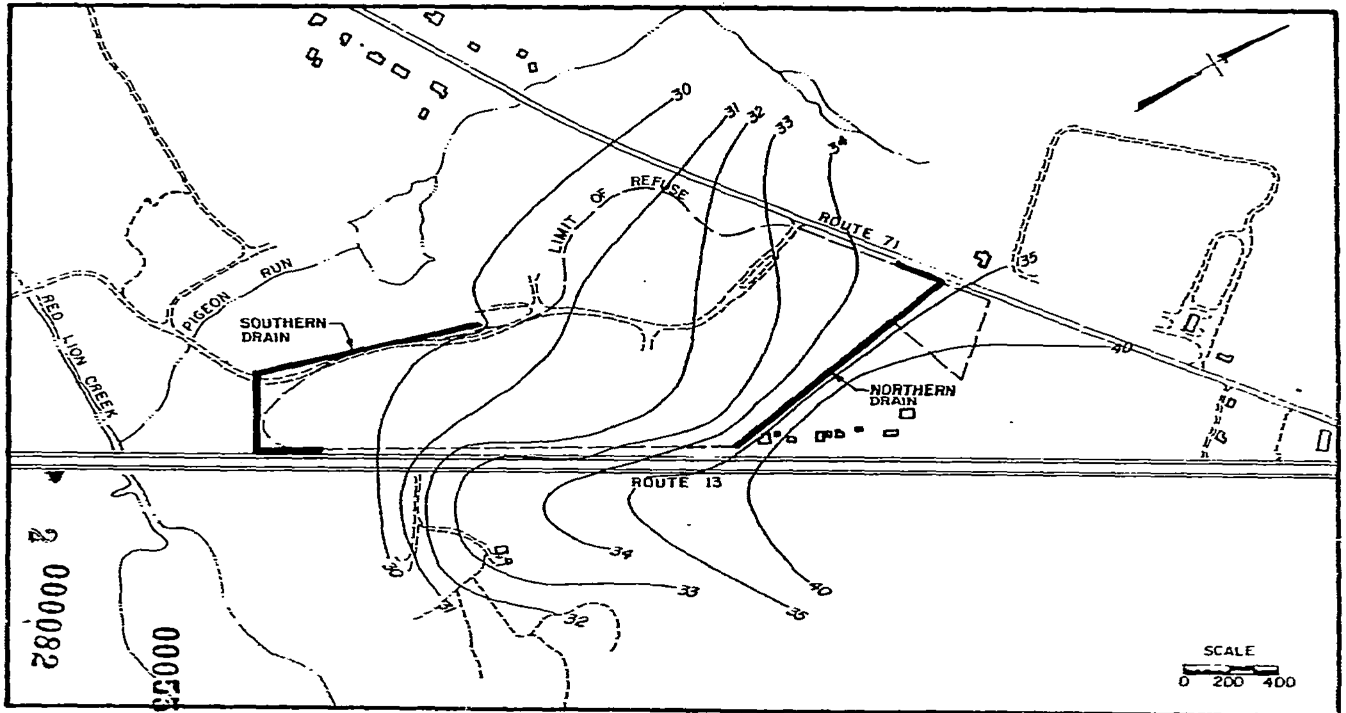


FIGURE 1

SIMULATED WATER TABLE CONTOURS AT STEADY STATE CONDITION
(approximately three years)

000536

2 000082

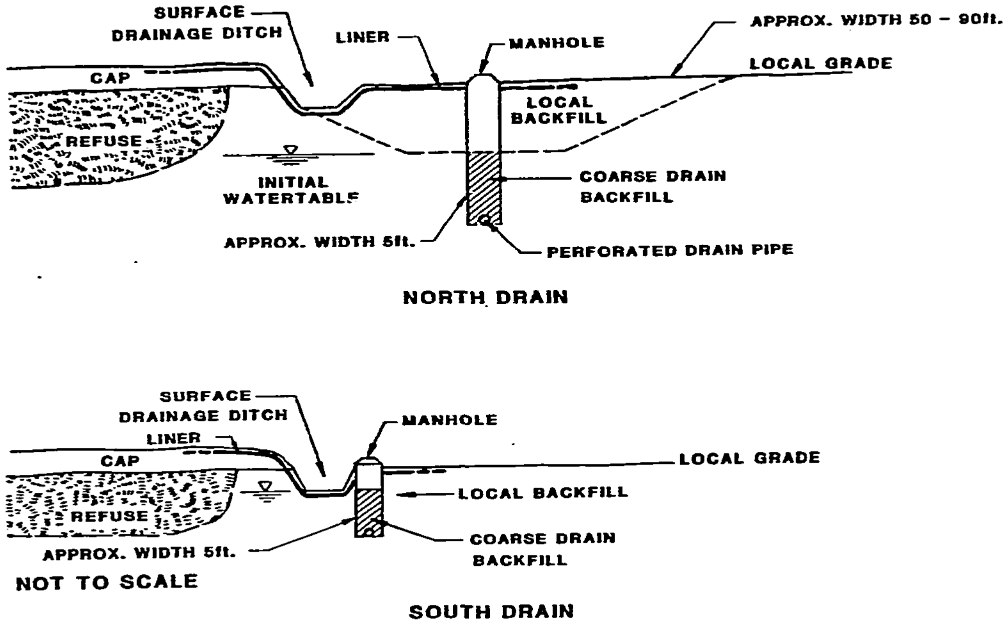


FIGURE 2

TYPICAL DRAIN SECTION

000557

2 000083

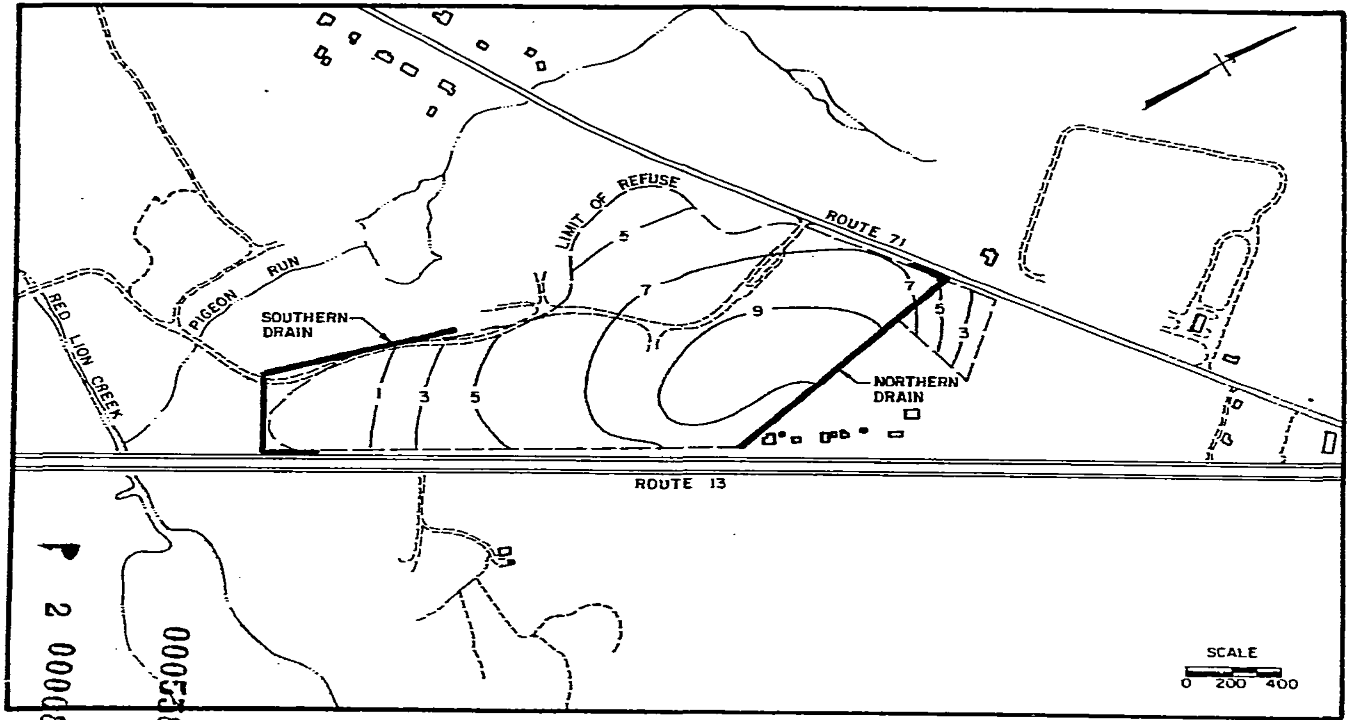


FIGURE 3

SIMULATED DECLINE IN WATER TABLE AT STEADY STATE CONDITION
(approximately three years)

464-002
10 September 1986

SUMMARY COST ESTIMATES

	UNIT	UNIT COST	CAPITAL (MILLIONS)
Fence & Security	8000 ft	$12 - 25/ft	$0.10 - 0.20
South Sump			0.04
South Drain	1600 ft	$118 - 173/ft	0.19 - 0.28
Pipe Line Rt 13	2000 ft	$25 - 40/ft	0.05 - 0.08
North Drain (open excav.)	900 ft	$458 - 514/ft	0.41 - 0.46
North Drain (sheet pile section)	500 ft	$1048 - 1147/ft	0.52 - 0.57
North Sump			0.04
Pipeline to Outfall	10000 ft	$25 - 40/ft	0.25 - 0.40
Treatment Years 1-3	20 - 200 gpm 10.5 - 105 Mil. gal/yr	$1.50 - 2.00/1000 gal	0.02 - 0.20(1)
West Excavation	63000 cy	$4.50 - 11.29/cy	0.28 - 0.71
West Backfill & Seed	63000 cy	$5 - 6.5/cy	0.32 - 0.41
Silt (2 ft, 0.67 cy/sy)	289,000 sy	$4.15/sy	1.20
Synthetic Membrane	289,000 sy	$1 - 3/sy	0.29 - 0.87
Subsoil (1.5 ft, 0.5 cy/sy)	289,000 sy	$3.13/sy	0.90
Topsoil & Seed (0.5 ft, 0.17 cy/sy)	289,000 sy	$1.65/sy	0.48
Gas Vents	60	$2000/ea & hazard	0.12 - 0.20
Monitoring System			0.10
		Total Construction Cost	5.31 - 7.14
		Eng & Design 10%	0.53 - 0.71
		Admin & Legal 5%	0.27 - 0.36
		Contingency 20%	1.06 - 1.43
		Grand Total	$7.17 - 9.64 Million

sy: square yards.
cy: cubic yards.
hazard at 70% where applicable.
(1) First year cost.

000559

464-002
12 September 1985

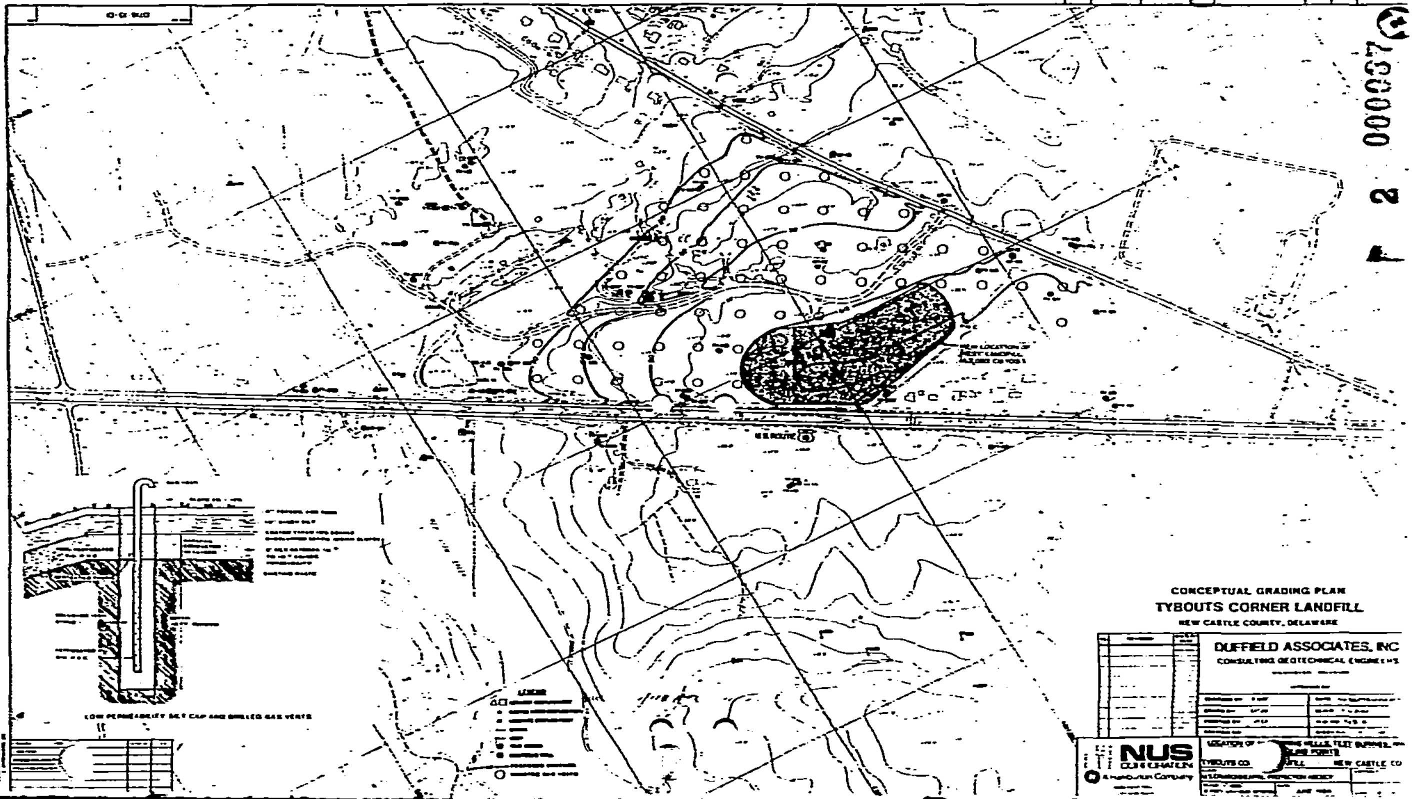
O&M COSTS

	ANNUAL COST ($/YR)	PERIOD (YRS)	O&M (1) PRESENT WORTH ($)
Fence & Security	$2,000	30	19,800
South Sump	1,000	30	9,900
South Drain	1,000 2,000	30 3	9,900 5,200
Pipe Line Rt 13	-	-	-
North Drain (open excav.) North Drain (sheet pile section)	1,000 2,000	30 3	9,900 5,200
North Sump	-	-	-
Pipeline to Outfall	-	-	-
Treatment	210,000 20,000	1 30	210,000 197,800
West Excavation	-	-	-
West Backfill & Seed	-	-	-
Silt (2 ft, 0.67 cy/sy)	-	-	-
Synthetic Membrane	10,000 10,000	30 3	98,900 26,100
Subsoil (1.5 ft, 0.5 cy/sy)	-	-	-
Topsoil & Seed (0.5 ft, 0.17 cy/sy)	5,000	30	49,400
Gas Vents	1,000	30	9,900
Monitoring System	.15,000	30	148,400
TOTAL			$800,400

(1) 10% rate over 30 years = $9.89/$1/year.
10% rate over 3 years = $2.61/$1/year.

000580

2 000086



000561

2 000037